
Table of Contents

Crash Sensitive Head Restraints

Subject	Page
Introduction	3
System Components	5
Head Restraint Bar	8
Head Restraint Frame	8
Pyrotechnic Actuator	8
Spring Actuating Mechanism	9
Button for Head Restraint Adjustment	9
Principles of Operation	10
Deployment in the Event of a Rear Impact	11
Electrical Connection	13
Head Restraint Versions	13
Service Information	14
Replacing the Pyrotechnic Actuator	14
Check Control Message	14
Retrofitting	14
Head Rest Retaining Catch	15
All Non-multifunction Seats	15
Multifunction Seats	15

Crash Sensitive Head Restraints

Models: E60, E61, E63, E64, E83, E70

**Production: From 9/2007 Production
E70 From 10/2007 Production**

OBJECTIVES

After completion of this module you will be able to:

- Identify which vehicles utilize the crash sensitive head restraints
- Explain the operation of the crash sensitive head restraint
- Explain how to replace a crash sensitive head restraint

Introduction

The crash sensitive head restraints will be fitted in the following vehicles as of 09/07:

- E60
- E61
- E63
- E64
- E83
- E70 (from 10/07)

The crash sensitive head restraint will replace the active head restraint on the luxury seat (multifunction seat).

Why crash sensitive head restraints?

The crash sensitive head restraints reduce the stresses on the spinal column in the neck area in the event of an impact from the rear.

For the vehicle occupants, correct adjustment of the head restraints and the distance between the head and the head restraint of decisive importance. Depending on the seat position and design, the distance between head and head restraint can be as much as 100 mm.

The crash sensitive head restraints have primarily been designed for rear impacts at moderate speeds, e.g. in urban traffic. Even in urban traffic conditions, injuries to the cervical vertebral column can occur with a conventional head restraint.

In the event of a rear impact, the front section of the head restraint is moved up to 60 mm forward by spring action within a split second.

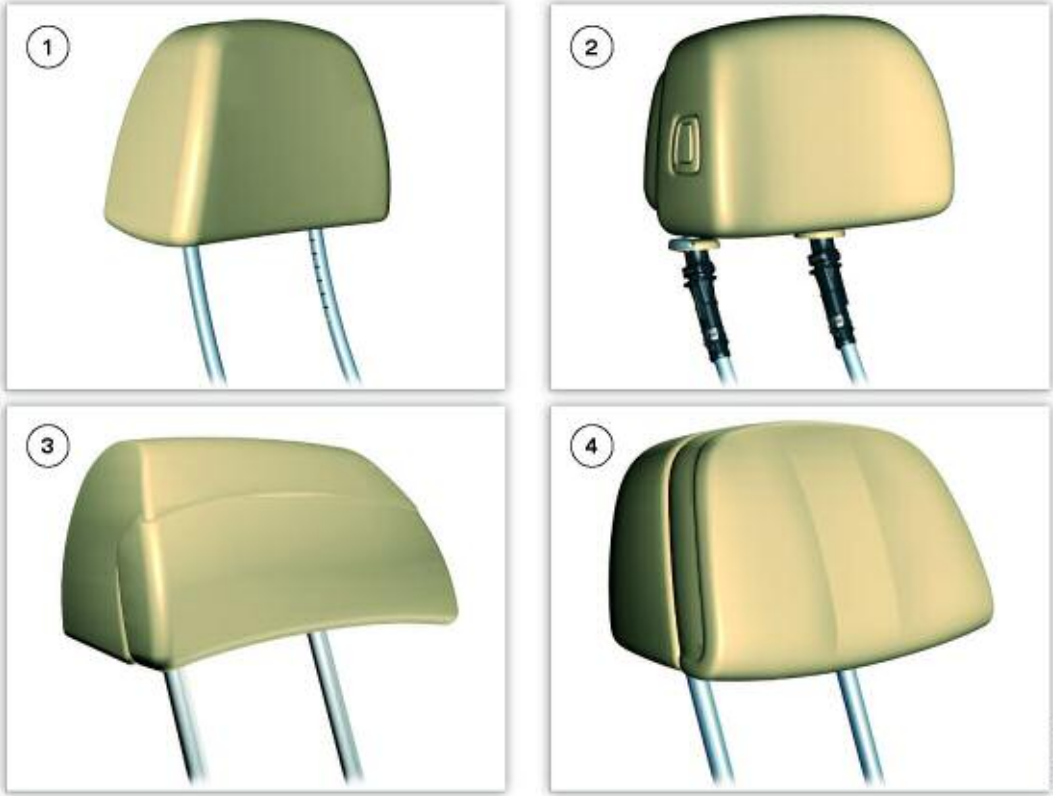
Even before the head is thrown backwards by the force of the rear impact, the crash sensitive head restraint has already shortened the distance between it and the head.

The shorter distance helps to increase the stabilizing and restraining function of the head restraint. As a result, injuries to the neck and cervical vertebral column can be reduced or even entirely prevented.

Note: Car manufacturers, magazines, insurance companies, motoring organizations, etc. regularly test head restraints. The BMW crash sensitive head restraints make a significant contribution to increasing car occupant safety. In future tests, the crash sensitive head restraints will have a positive effect on the overall safety rating of the vehicle.

The new head restraints are easy to identify. On the multifunction seat, the head restraint side panels now extend over the entire head restraint cushion. All other seats have a button on the side of the head restraint for adjusting the head restraint reach.

The crash sensitive head restraint in the E6x



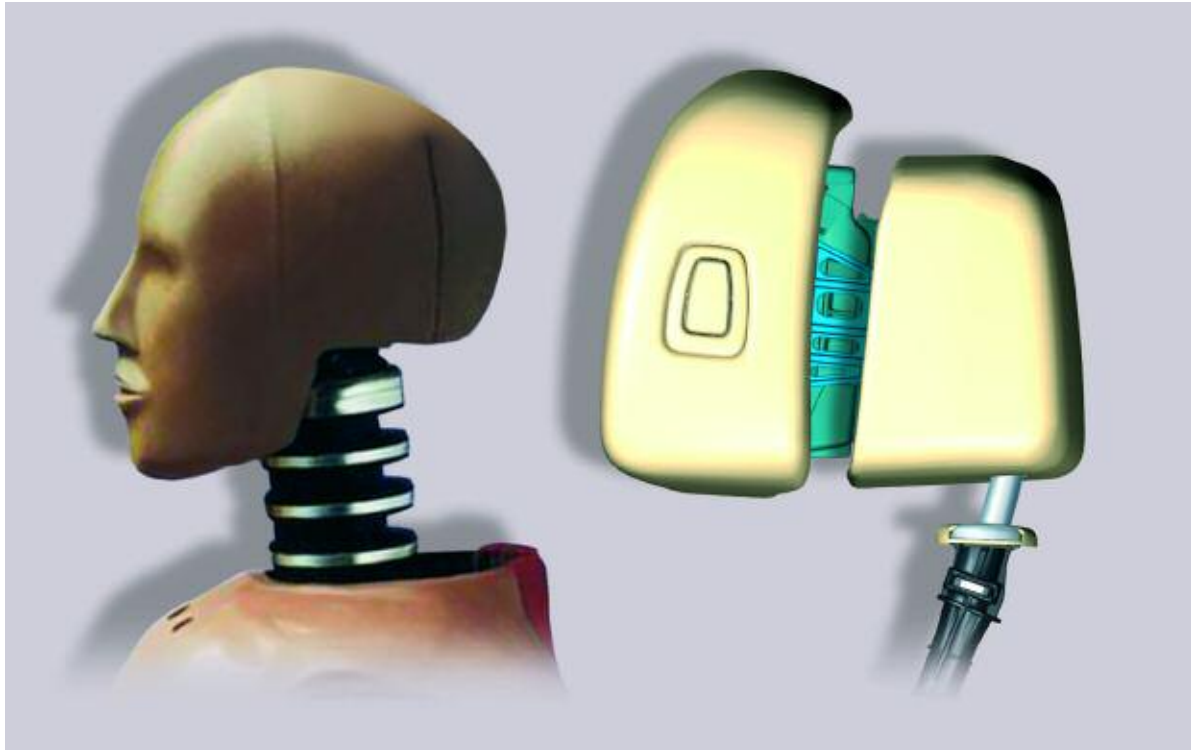
Index	Explanation
1	Previous head restraint
2	Crash sensitive head restraint
3	Previous multifunction seat head restraint
4	Multifunction seat crash sensitive head restraint

System Components

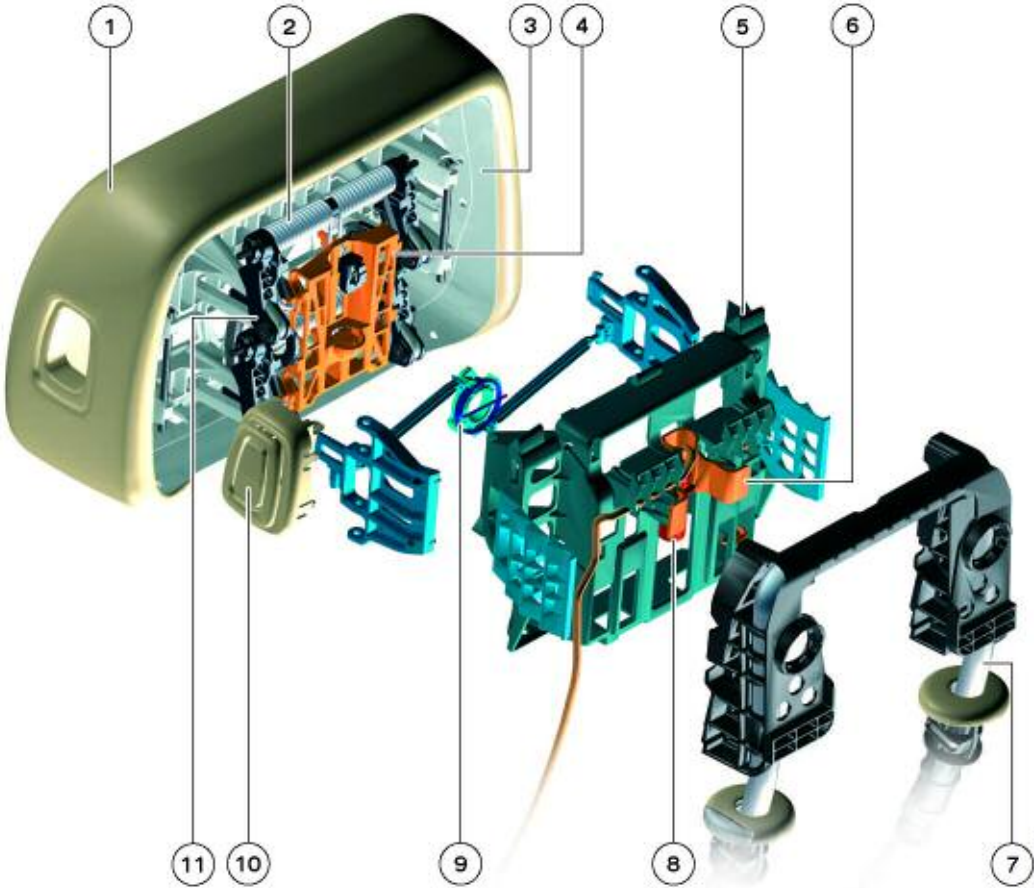
The essential components of the crash sensitive head restraint are the following:

- Head restraint bar
- Head restraint frame
- Impact plate and head restraint cushion
- Pyrotechnic actuator
- Spring actuating mechanism
- Button for head restraint adjustment

The button for adjusting the head restraint releases the mechanical lock preventing the cushion part being pushed backwards.

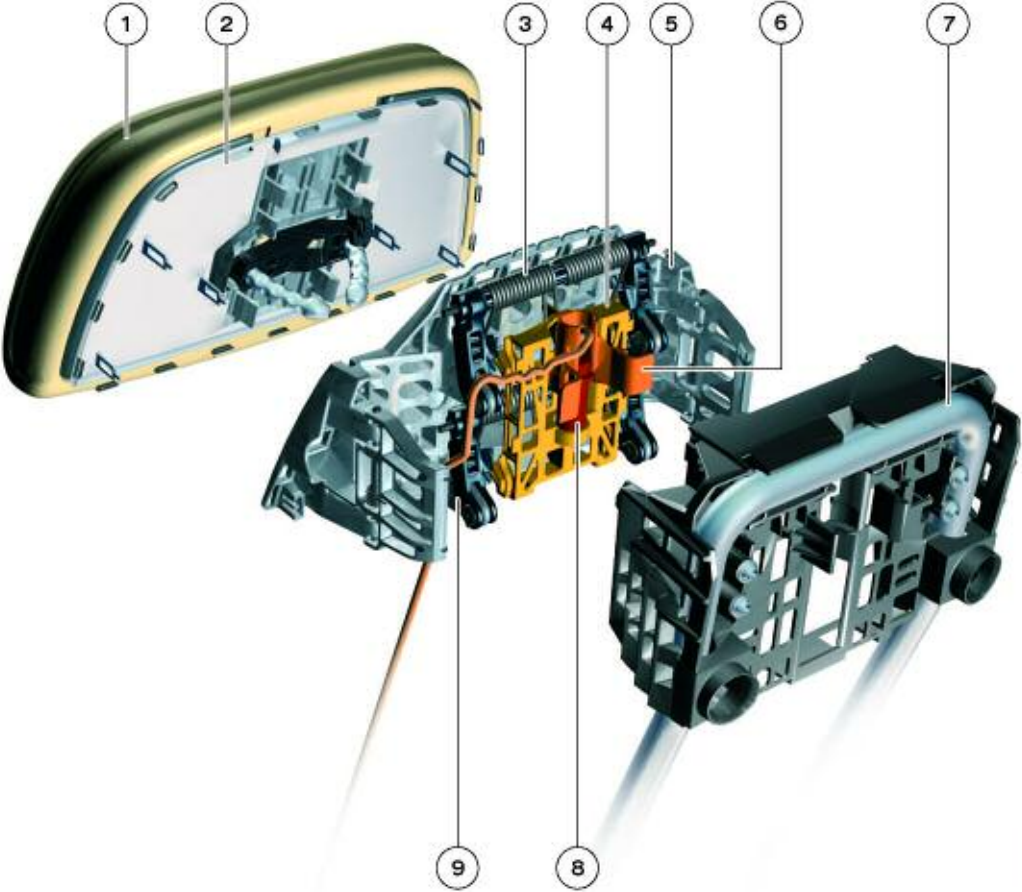


Exploded view of crash sensitive head restraint on E60



Index	Explanation	Index	Explanation
1	Head restraint cushion	7	Head restraint bar
2	Spring actuating mechanism	8	Pyrotechnic actuator
3	Head restraint impact plate	9	Linkage with catches for head restraint adjustment
4	Release plate	10	Button for head restraint adjustment
5	Head restraint frame	11	Head restraint actuating mechanism
6	Pyrotechnic actuator holder		

Exploded view of multifunction seat crash sensitive head restraint on E60



Index	Explanation	Index	Explanation
1	Head restraint cushion	6	Pyrotechnic actuator holder
2	Head restraint impact plate	7	Head restraint bar
3	Spring actuating mechanism	8	Pyrotechnic actuator
4	Release plate	9	Head restraint actuating mechanism
5	Head restraint frame		

Head Restraint Bar

The head restraint bar forms the physical connection to the seat. The head restraint bar has ratchet grooves to allow for height adjustment.

To protect the pyrotechnic actuator connecting lead, there is a catch that prevents the head restraint being withdrawn beyond the maximum height position. This means that the head restraint can not be removed from the seat.

Similarly, head restraints with power adjustment can not be removed from the seat.

Head Restraint Frame

The head restraint frame is attached to the head restraint bar. The head restraint frame houses the entire head restraint mechanism.

That includes the pyrotechnic actuator, the release mechanism and the actuating springs for the impact plate.

Pyrotechnic Actuator

The pyrotechnic actuator contains a detonator pellet.

As soon as the detonator pellet receives the detonation signal, the propellant is ignited.

The propellant deploys the release pin. The release pin pushes the release plate downwards, thereby releasing the actuating springs so that they push the impact plate and head restraint cushion forwards and upwards.

The pyrotechnic actuator contains a resistor that artificially keeps the signal at high after the head restraint has been deployed.

The Check Control message is generated by the safety systems control unit.

The signal for the Check Control message is transmitted via the vehicle's bus system to the instrument cluster. The instrument cluster displays the Check Control message. The Central Information Display may also display a complementary message.

Spring Actuating Mechanism

The actuating springs are held under tension by the release plate. As soon as the release plate releases the spring mechanism, the force of the springs comes into action. The actuating springs then push the impact plate and head restraint cushion forwards and upwards.

Button for Head Restraint Adjustment

The button releases the catches on the left and right of the head restraint frame by means of a linkage. This allows the head restraint cushion to be pushed backwards to adjust the head restraint reach.

Principles of Operation

In order to obtain the best possible comfort, the front part of the head restraint can be moved forwards or backwards by approximately 30 mm. There are two self-locating extended positions. That means that altogether there are three different settings for head restraint reach.

To move the front part of the head restraint forwards, it simply has to be pulled forwards until it snaps into one of the two locating positions.

To move it back, the button on the side of the crash sensitive head restraint has to be pressed. This releases the catch and the front part of the head restraint can be moved back.

Adjustment positions of crash sensitive head restraint in E6x



Index	Explanation
1	Head restraint front section in normal position (retracted)
2	Head restraint front section in center position
3	Head restraint front section fully extended

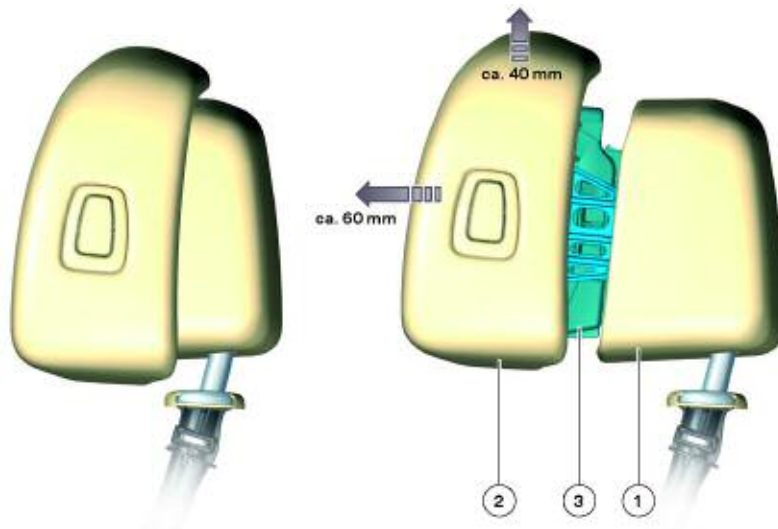
Deployment in the Event of a Rear Impact

The vehicle's safety electronics detect the occurrence of a rear-end impact by means of sensors. If the vehicle (the BMW suffering the impact) reaches a certain velocity differential within a specified period of time, the crash sensitive head restraints are deployed. This can occur even with a relatively light rear impact.

That means that the crash sensitive head restraints can be deployed even with a relatively light rear impact.

If the safety electronics detect a major rear impact, other safety equipment such as seat-belt tensioners or the safety battery terminal may also be deployed.

Left: undeployed E60 head restraint; right: E60 head restraint after deployment



Index	Explanation
1	Head restraint base
2	Head restraint front section
3	Head restraint mechanism

The vehicle's sensor systems control unit initiates deployment of the crash sensitive head restraints. To do so, the control unit transmits the detonation signal for the detonator pellet in the head restraint's pyrotechnic actuator.

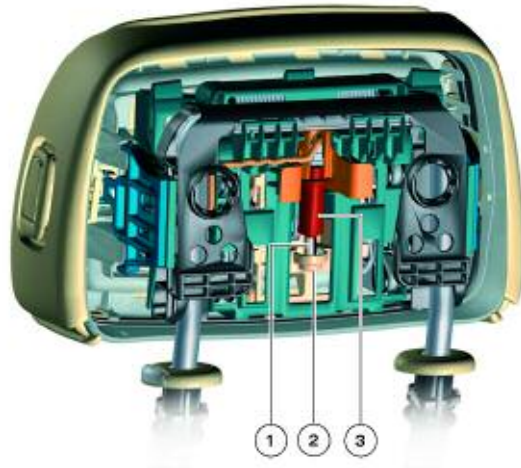
The pyrotechnic actuator releases head restraint actuation mechanism by operating the release plate. The front section of the head restraint is then free to move forwards under the force of the springs.

The maximum forward travel of the head restraint cushion is 60 mm; the cushion is also raised by up to 40 mm at the same time.

Pyrotechnic actuator (normal state)



Pyrotechnic actuator (deployed state)



Index	Explanation
1	Pyrotechnic actuator holder
2	Release plate
3	Pyrotechnic actuator

Index	Explanation
1	Pin deployed
2	Release plate
3	Pyrotechnic actuator

If the front part of the head restraint is pushed backwards after it has deployed, it does not stay in that position but is pushed forwards again by the springs. It will not lock back into the undeployed position until the pyrotechnic actuator has been replaced.

Note: If the crash sensitive head restraint has been deployed, the pyrotechnic actuator must be replaced by a BMW dealer. It is essential to follow the repair instructions.

Electrical Connection

The head restraint is connected to the safety system control unit by a two-core cable.

Therefore, the head restraint has a catch which prevents it being raised beyond its highest adjustment position and removed from the seat.

The safety system control unit on the E60, E61, E63 and E64 is the ACSM (Advanced Crash and Safety Management).

The control unit for the safety system on the E83 is the MRS (Multiple Restraint System) control unit.

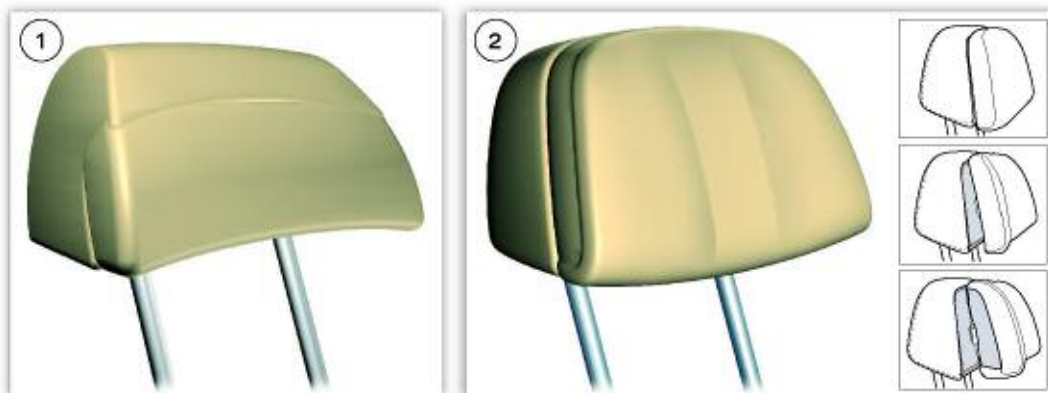
Connection to electrical system



Head Restraint Versions

Two versions of the head restraint are fitted.

One version is for all seats other than the luxury seat (multifunction seat). The luxury seat has a special version of its own. The luxury seat has adjustable side supports on the head restraint. The side supports on the crash sensitive head restraint now extend across the whole of the head restraint contact area.



Index	Explanation
1	Head restraint side supports on previous multifunction seat
2	Head restraint side supports on multifunction seat with crash sensitive head restraint

Note: The head restraint for the luxury seat can be adjusted for reach. The head restraint reach can be adjusted by means of the upper backrest adjuster.

Service Information

Replacing the Pyrotechnic Actuator


If the crash sensitive head restraint has been deployed, the pyrotechnic actuator must be replaced by a BMW dealer. After replacing the pyrotechnic actuator, clear the fault memory. It is essential to follow the repair instructions.

Replacement of the pyrotechnic actuator does not require an explosives certificate in Germany.

The pyrotechnic actuator has been exempted from the explosives certificate requirement by the German Federal Materials Testing Office.

Check Control Message

After the crash sensitive head restraint has been deployed, the instrument cluster displays a CC message. The Central Information Display also displays complementary information at the same time.

Check Control Message	Description	Text in Central Information Display
	Restraint System Fault	Restraint system fault Function of airbag, seat belt tensioner, belt force limiter and crash sensitive head restraint impaired. You should still fasten your seatbelt. Have the fault checked by your BMW dealer.

Retrofitting

There is no retrofit option available.

Head Rest Retaining Catch

The head restraint is connected to the safety system control unit by a two-core cable. Therefore there are spring clips fitted that prevent the head restraint from being completely withdrawn.

To remove the head restraint, the rear panel of the seat backrest has to be removed.

All Non-multifunction Seats

One of the head restraint bars has a locating notch about two thirds of the way down. A spring clip engages in that notch. The spring clip is inside the seat backrest on the head restraint guide sleeve.

When the spring clip is released the head restraint can be fully withdrawn from the seat backrest. In order to release the spring clip and disconnect the pyrotechnic actuator connector, the rear panel of the seat backrest has to be removed.



Multifunction Seats

On each head restraint bar end there is a locating groove. There is a spring clip in each one.

Both spring clips have to be released. The head restraint can then be completely withdrawn from the seat backrest. In order to release the spring clip and disconnect the pyrotechnic actuator connector, the rear panel of the seat backrest has to be removed.

